

TECHNICAL MANUAL
FOR
WATER RECOVERY SYSTEM

NSN: 6530-01-330-7455

MODEL: PRA 525

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WARNING

**WHEN IN OPERATION, THIS WATER RECOVERY SYSTEM CAN CAUSE
BURNS IF THE WATER HOSE CONNECTORS ARE TOUCHED WITHOUT
PROTECTION.**

Use heat protective gloves or allow to cool before touching.

NOTE

**TO USE THE WATER RECOVERY SYSTEM THE STERILIZER MUST HAVE
THE WATER RECOVERY ADAPTOR KIT INSTALLED**

WARNING

HIGH VOLTAGE is used in the operation of this equipment.

DEATH MAY RESULT ON CONTACT

**Be careful not to contact high voltage connections when installing or operating this
equipment.**

**SHUT OFF and UNPLUG the POWER SUPPLY to the equipment before beginning
work on it.**

HOW TO USE THIS MANUAL

This manual provides a source of reference that will assist you in preparing and operating the Water Recovery System for use with the Sterilizer, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting, NSN 6530-00-926-2151.

The manual is arranged in four chapters that are further broken down into sections. Appendixes, Figures (illustrations), Tables, and an Index are included to help you locate any item in this manual.

All paragraphs and figures are assigned numbers keyed to the chapter and sequence in which they appear. For example, figure 2-1 is the first figure in chapter 2 and figure 2-2 is the second figure in chapter 2. Pages are in numerical sequence.

To operate the Water Recovery System (WRS), you must know:

1. How to install, assemble, and disassemble the equipment;
2. How to turn the WRS on and off;
3. When the WRS is working properly and when it is not;
4. How to clean the WRS and perform preventive maintenance checks and services (PMCS);
5. How to use the troubleshooting procedures; and
6. When to call for help.

OPERATOR'S MANUAL
for
WATER RECOVERY SYSTEM

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 directly to: Commander, USAMMA, ATTN: SGMMA-M, Frederick, MD 21701-5001. A reply will be sent to you.

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CHAPTER 1

INTRODUCTION

Section 1. GENERAL INFORMATION

1-1. SCOPE.

- a. Type of Manual: Operator's Manual
- b. Equipment Name: Water Recovery System (WRS).
- c. Purpose of Equipment: The WRS recovers and reuses condensate and exhaust steam from one or two Sterilizer(s), Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal, NSN 6530-00-926-2151, and pumps the recovered water back to the sterilizer(s).
- d. Required 2151 Modifications: To use the WRS, the 2151 FIRST MUST BE MODIFIED by the installation of the 2151 Adapter Kit, NSN 6530- XX-XXX-XXXX, by Medical Maintenance. The adapter kit consists of hoses and fittings that conduct steam from the sterilizer to the WRS and water back to the sterilizer from the WRS.

1-2. MAINTENANCE FORMS AND RECORDS. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TB 38-750-2, Maintenance Management Procedures for Medical Equipment.

1-3. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR). If your WRS needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you do not like about your equipment. Let us know why you do not like the design or performance, Put it on a SF 368 (Quality Deficiency Report). Mail it to us and we will send you a reply. Our address is:

Commander
USAMMA
ATTN: SGMMA-M
Frederick, MD 21701-5001

SECTION II. EQUIPMENT DESCRIPTION AND DATA

1-4. **PURPOSE OF THE WRS.** The WRS is designed specifically for use with the Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal, NSN 6530-00-926-2151, hereafter called the 2151. The WRS captures the exhaust steam from one or two 2151s, condenses it into water, and pumps the water back to the 2151 boiler(s) when switched to the return mode. The WRS reduces water consumption of the 2151 from 2.5 gallons to less than 1 quart per sterilizer load.

1-5. LOCATION AND DESCRIPTION OF MAJOR COMPONENTS.

1-5.1 **Major Exterior Components, Right Side.** The major exterior components of the right side of the WRS are shown in figure 1-1 and described below (the right side has four quick disconnect hose fittings).

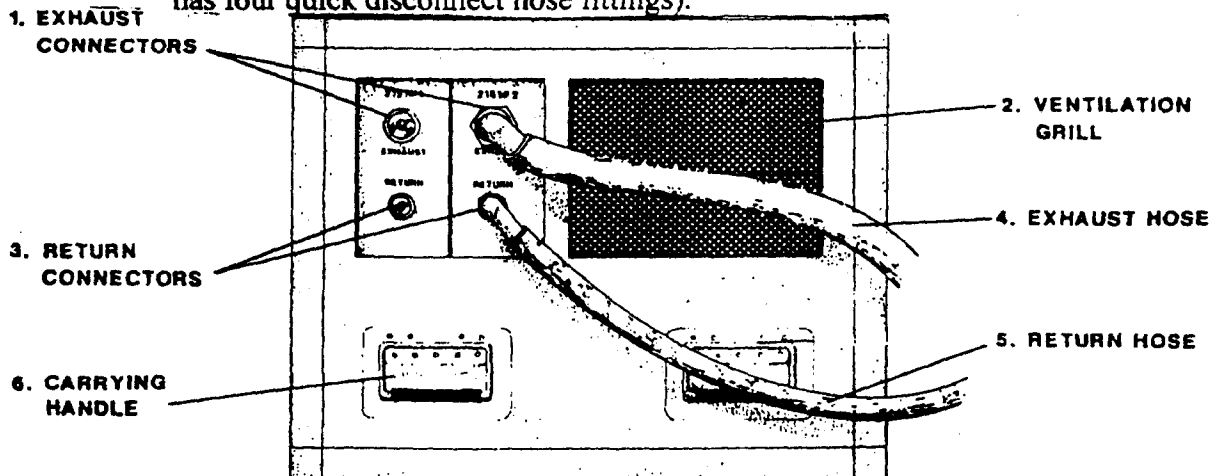


FIGURE 1-1. Major Exterior Components, Right Side.

1. EXHAUST CONNECTORS (2) – connect the exhaust hose to WRS.
2. VENTILATION GRILL – allows exit of hot air.
3. RETURN CONNECTORS (2) – connect the return hoses to the WRS.
4. EXHAUST HOSES (2) – drain the exhaust steam and water from the 2151s to the WRS.
5. RETURN HOSES (2) – return the recovered, condensed water from the WRS to the 2151 boilers.
6. CARRYING HANDLES (2) – used when moving the WRS.

1-5.2 Major Exterior Components, Left Side. The major exterior components of the left side of the WRS are shown in figure 1-2 and described below.

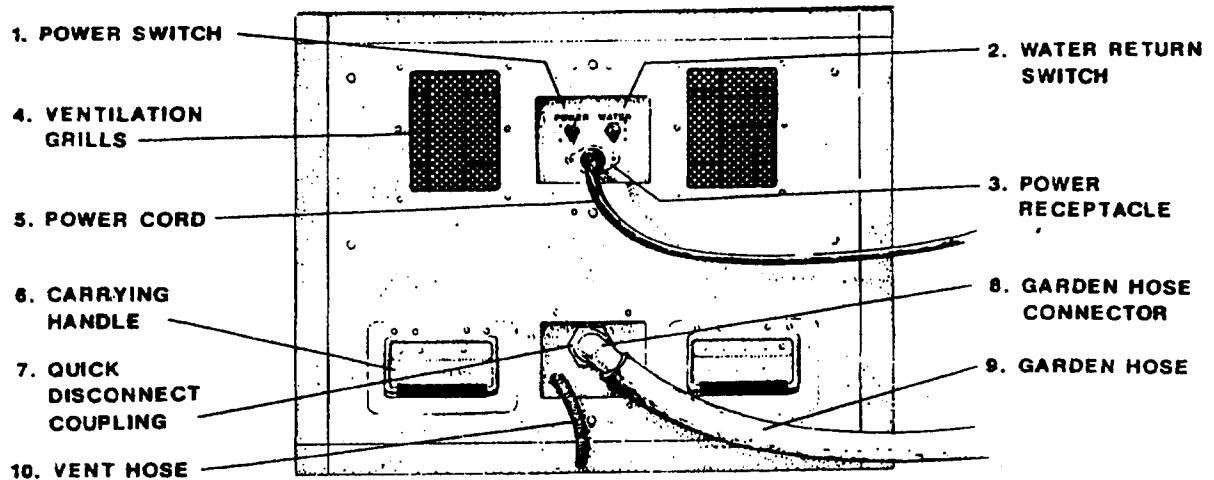


FIGURE 1-2. Major Exterior components, Left Side.

1. POWER SWITCH – turns the electricity on and off to the WRS.
2. WATER RETURN SWITCH – controls the flow of water through the WRS or to the 2151(s).
3. POWER RECEPTACLE – connects the power cord to the WRS internal electrical circuit.
4. VENTILATION GRILLS (2) – allow entry of cool air and monitoring of water level.
5. POWER CORD – connects the 115 V power source to the WRS power receptacle.
6. CARRYING HANDLES (2) – used when moving the WRS.
7. QUICK DISCONNECT COUPLING – allows quick coupling/uncoupling of the hose.
8. GARDEN HOSE CONNECTOR – connects the garden hose to the WRS.
9. GARDEN HOSE – connects water supply to WRS garden hose connector.
10. VENT HOSE – carries excess water from the tank to the outside of the WRS.

1-5.3. Major Interior Components, Back View. The major internal components viewed from the back of the WRS are shown in figure 1-3 and described below.

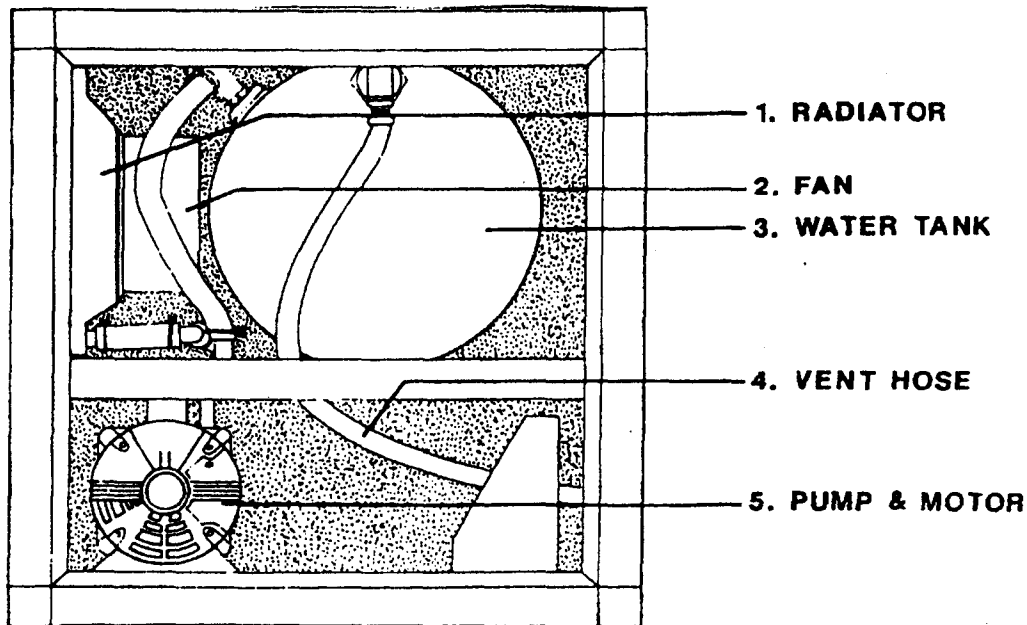


FIGURE 1-3. Internal Components, Back View.

1. RADIATORS (2) – used to cool the hot, circulating water.
2. FANS (2) – blow air through the radiators to cool the hot water.
3. WATER TANK – condenses the 2151 exhaust steam and stores the recovered water until it is returned to the 2151 boiler(s).
4. VENT HOSE – carries excess water from the water tank to the outside of the WRS.
5. PUMP AND MOTOR – circulate water through WRS or to the 2151(s).

1-5.4. Major Interior Components, Front View. The major internal components viewed from the front of the WRS are shown in figure 1-4 and described below.

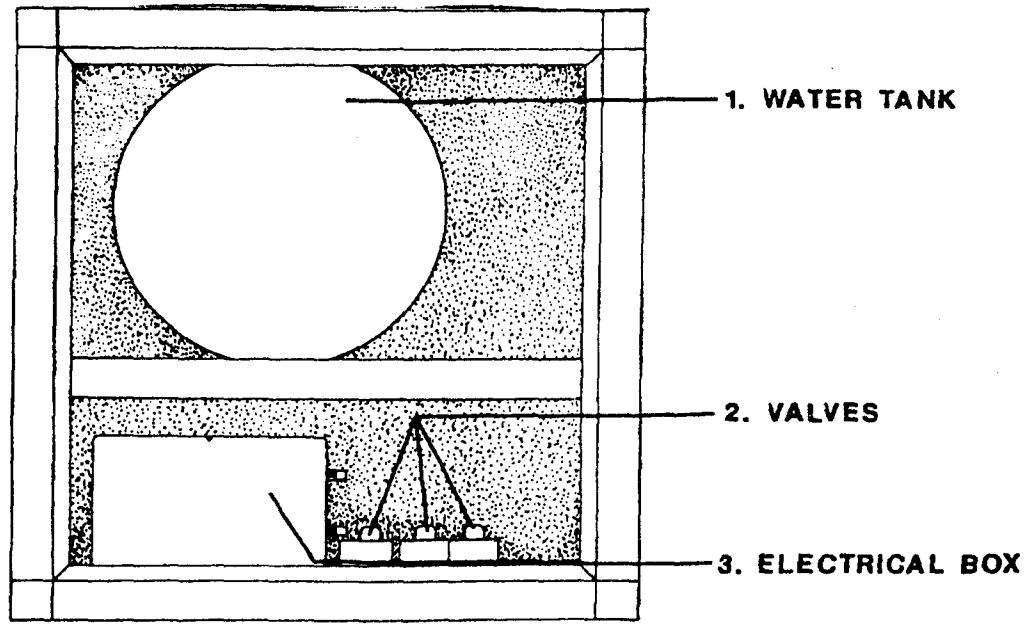


FIGURE 1-4. Internal Components, Front View.

1. **WATER TANK** – holds the water used to condense the 2151 exhaust steam and stores the recovered water until it is used to refill the 2151 boiler(s).
2. **VALVES (3)** – solenoid, check, and relief valves control the flow of water through the WRS.
3. **ELECTRICAL BOX** – contains electrical terminal strips, fuses, and relays.

1-6. PHYSICAL DATA.

a. Dimensions.

Length (sides with handles)	30.00 inches
Width	23.25 inches
Height	24.00 inches
Weight (empty)	200 pounds
Water tank capacity	10 gallons

b. Power.

AC – 115 volt, 50/60 Hz, 1 Phase, 20 amp, 1000 watts.

1-7. WATER SOURCES. Use potable water or water filtered to remove mud, sediment, and minerals that would clog the 2151 boiler(s).

1-8. DESCRIPTION OF OPERATING PRINCIPLES. Exhaust from the 2151(s) is discharged into and condensed in the WRS water tank. The water in the WRS is pumped from the water tank, through the radiators where it is cooled by the air from the fans, and back to the water tank. The water circuit can be opened by a solenoid valve controlled by the water return switch to pump water back to the 2151 boiler(s).

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

- 2-1. **CONTROLS AND INDICATORS.** The operator's controls and indicators are shown in figure 2-1 and described in table 2-1 below.

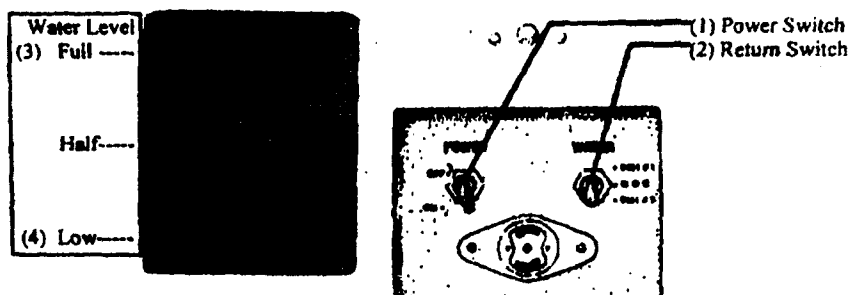


FIGURE 2-1. Operator's Controls and Indicators.

TABLE 2-1. Operator's Controls and Indicators.

KEY	CONTROL OR INDICATOR	FUNCTION
1	Power Switch	A two-way toggle switch that turns power on and off in the WRS. Throwing the toggle lever down turns the power on; throwing the lever up turns the power off.
2	Water Return Switch	Controls the flow of water within the WRS. Holding the switch down or up pumps water back to the sterilizer indicated.
3	Full Water Level Line	Water level in the tank is viewed through the ventilation grills near the power switch. When Filling the tank, fill only to the full line.
4	Low Water Level Line	The water level shall always be between the $\frac{1}{2}$ full and full line before operating the 2151.

NOTE: Water level is indicated by the position of the white ball visible through the screen panel.

Section II. PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

- 2-2. PMCS TABLE. Table 2-2 provides instructions for PMCS at the operator's level.
- a. The heading, Item to be Inspected, describes the item to be inspected.
 - b. Each item to be checked is numbered in the first column, Item No. Always do PMCS in the same order according to this number. The number is to be used For the TM number column on the DA Form 2420, Equipment Inspection and Maintenance Worksheet, in recording the results of PMCS.
 - c. The second column of the table, Interval, shows the interval at which the check is to be performed. An asterisk (*) is shown in the appropriate subcolumn to identify the frequency with which it should be performed. All PMCS are to be performed as scheduled and under the following conditions:
 - (1) When equipment is installed.
 - (2) When equipment is reinstalled after being moved/removed for any reason.
 - d. The third column of the table, Procedure, provides instructions for performing the check. If corrective action is indicated, the required instructions are provided here.
 - e. The last column, Equipment is not Ready/Available, tells why the WRS should not be used until repaired, identifies the problem, and gives the procedure for correction. Report any deficiencies using proper forms (see TM 38-750). Any defects noted that are beyond the scope of the Organizational Maintenance shall be reported immediately to the maintenance supervisor.
 - f. If something does not work, troubleshoot with instructions in this manual (Chapter 3, Section II, p 17) and tell your supervisor or call Medical Maintenance.
 - g. All PMCS can be performed with the POWER ON.

TABLE 2-2. Operator's Preventive Maintenance Checks and Services (PMCS)

NOTE: These PMCS are to be performed in the order listed.

B – Before daily operation D – During operation A – After operation W – Weekly

ITEM NO.	INTERVAL B D A W	ITEMS TO BE INSPECTED PROCEDURE	EQUIPMENT IS NOT READY/AVAILABLE IF:
1	* *	WATER LEVEL Water level in water tank shall be above the low water level line.	below the low level line. FILL WITH POTABLE WATER TO THE FULL LINE.
2	*	QUICK DISCONNECT COUPLINGS- CLEAN Wipe the male end (plug) and swab out The female end (socket) with a clean cloth.	coupling is dirty. CLEAN IF DIRTY.
3	*	POWER CORD AND HOSES Check power cord and hoses for signs of damage, excessive wear, or loose and improper connections.	the cord or hoses are excessively worn or damaged. CALL MEDICAL MAINTENANCE.
4	*	EXTERIOR SURFACES AND SWITCHES Visually check for dents, cracks, Corrosion, and missing and broken parts.	damage interferes with operation. CALL MEDICAL MAINTENANCE.
5	* * *	WATER TANK, FITTINGS, RADIATOR, AND INTERNAL HOSES. Turn on power switch and check For water or steam leaks.	major leaks are present. CALL MEDICAL MAINTENANCE.
6	*	WATER TANK – DRAIN Drain water from the tank by attaching the garden hose to the garden hose connector. Place the other end of hose in a pail and water will drain by gravity.	water contains rust, Sediment, or lint. DRAIN AND REFILL WITH POTABLE WATER.

Section III. OPERATING INSTRUCTIONS

2-3. PREPARATION FOR USE. To Prepare the WRS for use, follow these steps:

- a. The 2151(s) should have already been modified with the 2151 Adapter kit by Medical Maintenance. (You can't operate the WRS without these Modifications and components.)
- b. Using a straight blade screwdriver, remove the left end panel (left end of the WRS when the operator is facing the power switch). Turn all the screws in The panel (panel fasteners) one half turn clockwise. The panel should fall out or may be removed by gentle prying between the panel and the frame.
- c. Remove the power cord and the garden hose adapter (figure 2-2) from inside the WRS.

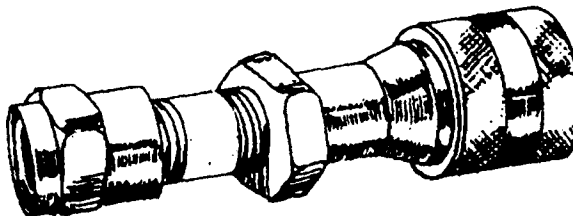


FIGURE 2-2. Garden Hose Adapter.

- d. Replace the end panel and turn the panel fasteners one half turn counterclockwise to secure the panel in the frame.
- e. Slide the WRS underneath the 2151 between the support legs. The second 2151 (if used) should be placed on the left side of the first 2151 (when the operator is facing the first 2151 controls) so the operator will have access to the WRS controls.
- f. Turn the WRS power switch off (figure 2-1) and attach the power cord to WRS by inserting the power cord plug (female end) into the WRS power cord receptacle. Attach the other end to a 115 volt power source.

- g. Locate and identify the following hoses shown and described below (figure 2-3).

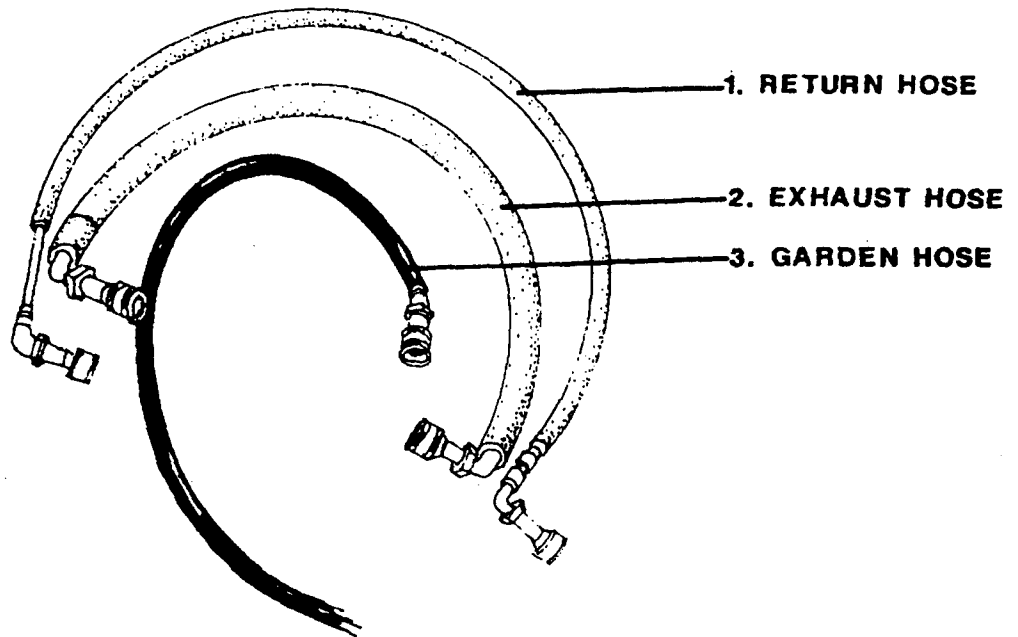


FIGURE 2-3. Hoses.

1. RETURN HOSE – approximately $\frac{1}{2}$ inch in diameter with quick disconnect sockets on both ends. Store in the 2151 sterilizer chamber.
 2. EXHAUST HOSE – approximately $\frac{3}{4}$ inch in diameter with quick Disconnect sockets on both ends. Store in the 2151 sterilizer chamber.
 3. GARDEN HOSE – a garden hose with male and female threaded ends. Store in the 2151 sterilizer chamber.
- h. Attach the female threaded end of the garden hose to a water faucet.
- i. Attach the garden hose adapter (figure 2-2) to the garden hose by screwing it onto the male end of the hose.

- j. To couple the quick disconnect socket of the hose to the quick disconnect (figure 2-4), pull back the quick disconnect sleeve, push the socket onto the connector, and release the sleeve.

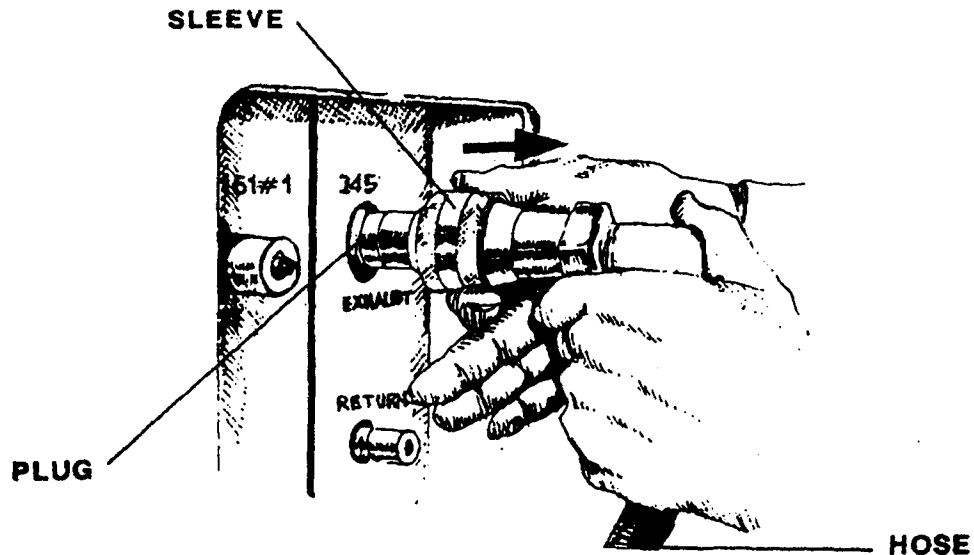
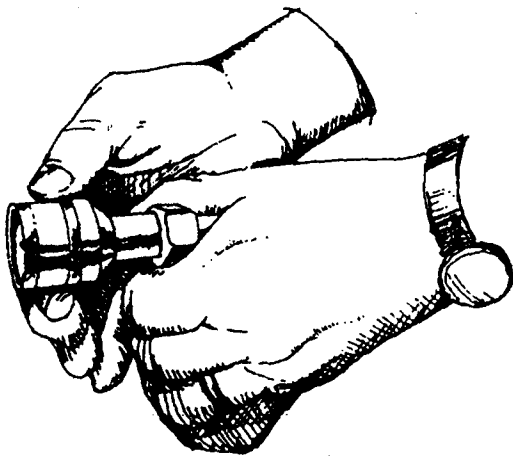


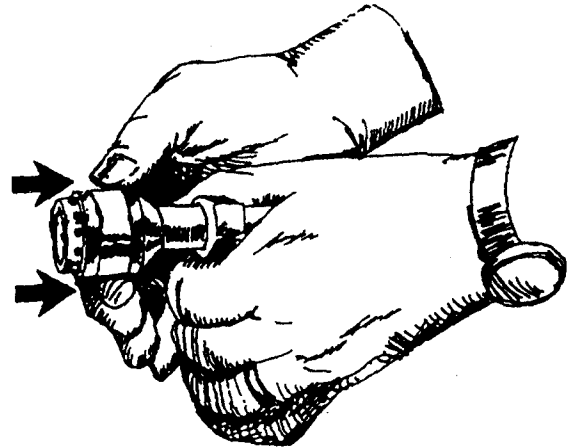
FIGURE 2-4. Quick Disconnect Engagement.

- k. Check to see if properly coupled by pulling back gently on the hose. The coupling should remain firmly in place. If it doesn't repeat sections 2-3, j and k.
- l. Connect the garden hose socket to the WRS garden hose connector.
- m. Fill the water tank by turning on the faucet. Turn the faucet off when the water Level in the WRS has reached the full line. (Figure 2.1)
- n. If the 2151 sight glass reads low or empty and the 2151 has not yet built up steam Pressure (pressure gauge reads 0 pounds per square inch gauge), the 2151 boiler can be filled easily from the WRS. First fill the WRS until the water tank is full. Remove the plug from the 2151 funnel by unscrewing the T-handle (see "Instruction Manual for Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal," page 6). Hold the WRS return switch lever up or down (depending on which 2151 you are filling), allow the 2151 to fill until the water level in the sight glass reaches full, and release the lever. Screw the funnel plug back into the 2151 funnel. Refill the WRS water tank and turn the faucet off.

- o. To disconnect the quick disconnect socket of the hose from a connector (figure 2-5), pull back the quick disconnect sleeve and pull gently on the hose until the socket disconnects from the connector. Water flow is automatically stopped from both ends of the quick disconnect when the socket is removed from the connector.



SLEEVE IN NORMAL POSITION



SLEEVE PULLED BACK

FIGURE 2-5. Quick Disconnect Separation.

- p. Disconnect the garden hose from the WRS (section 2-3.n.). This will prevent Accidental draining of the water from the water tank if someone unscrews the garden hose from the water source faucet.
- q. Attach one end of the 2151 exhaust hose (larger diameter hose) to 2151 exhaust Connector. Attach the other end to the WRS exhaust connector #1. If a second 2151 is to be used, connect the second return hose between the second 2151 and the WRS return connector #2.
- r. Attach one end of the return hose (smaller diameter hose) to the 2151 connector and the other end to the WRS return connector #1. If a second 2151 is to be used, connect the second return hose between the second 2151 and the WRS return connector #2.
- s. Place a pan under the vent hose to catch any excess water.

- t. Turn the WRS power switch on (figure 1-2).
- u. Turn the power to the 2151(s) in accordance with "Instruction Manual for For Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal." Page 6.
- v. After each 2151 operating cycle, check the 2151 water sight glass. When the water in the sight glass is below one quarter full, add water by holding the WRS water return switch lever up or down (depending on which 2151 needs water). When the sight glass reads full, release the water return switch and water will stop flowing to the 2151.

2-4. PREPARATION FOR SHUTDOWN. To prepare the WRS for shutdown, follow these steps:

- a. Listen for the hum of WRS fans. If the fans are still running, allow the WRS to Continue cooling the water until the fans shut off automatically.
- b. When the fans have stopped running, turn the WRS power switch off.

2-5 PREPARATION FOR MOVEMENT. Prepare the WRS for shipment as follows:

- a. Shutdown the WRS as described in section 2-4.
- b. Turn off the WRS power switch and disconnect the power cord from the power source.
- c. Disconnect the power cord from the WRS. coil the cord neatly and place inside the WRS by removing the left panel (section 2-3.b).
- d. Allow the 2151 to cool until the boiler pressure is 0 psig.
- e. Disconnect the exhaust and return hoses from the 2151(s) and the WRS exhaust and return connectors.
- f. Unscrew the garden hose from the water faucet. Once this end of the hose is lower than the WRS water tank, water from the tank will drain out. Therefore, put this end in a suitable place to empty 10 gallons of water (a pail or onto the ground outside) and allow the water to empty by gravity.
- g. Remove the garden hose from the garden hose connector.

- h. Drain, coil, and place the garden hose and adapter inside the 2151 sterilizer chamber.
- i. The exhaust and return hoses must be drained before storing. This requires two people, one person at each end of the hose. In the center of each quick disconnect socket is a poppet (a spring loaded plug) (figure 2-6). Holding the poppets depressed with the eraser end of a pencil, the water drains from the hose when one hose end is below the rest of the hose. Drain all the water from the hoses, coil, and store in the 2151 sterilizer chamber.

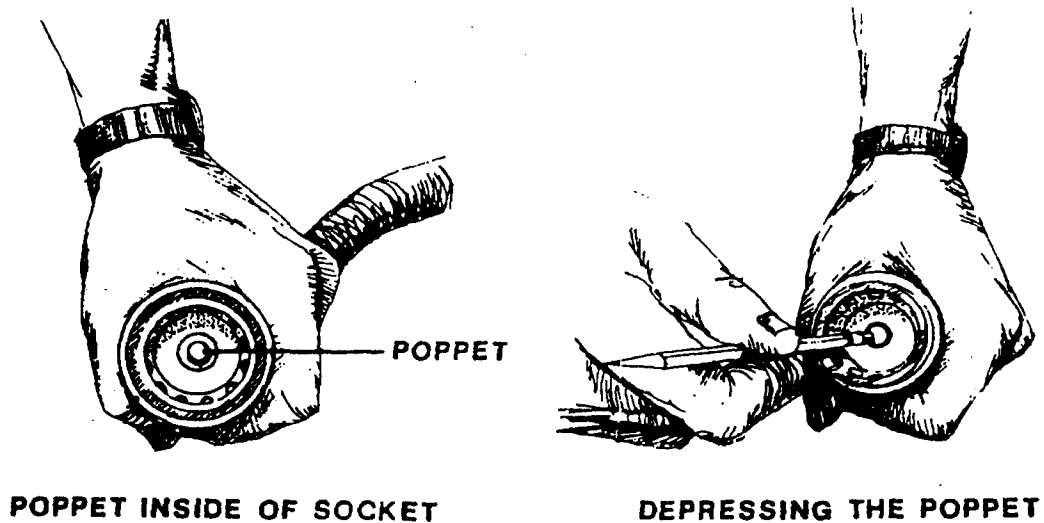


FIGURE 2-6. Draining Hose.

- j. Store the Operator's manual conveniently in the WRS and replace the end panel (section 2-3.c.).

Section IV. OPERATING UNDER UNUSUAL CONDITIONS

2-7. **HIGH AMBIENT TEMPERATURES.** When the outside temperature is high (100 degrees F or greater), more water must circulate through the radiators for a longer time to cool. If the 2151s are in constant use, steam may discharge from the vent hose. If this happens, the water in the WRS is not cooling fast enough. Delay the start of the next 2151 cycle until the WRS cooling fans shut off automatically. The best time to sterilize is in the cool evening, night, and early morning hours.

2-8. **LOW AMBIENT TEMPERATURES.** When the outside temperature is low (32degrees F or less), start up and run one of the 2151s attached to the WRS. Operate the 2151 through a sterilizer cycle every 2-3 hours to keep the water in the WRS from freezing. Alternate 2151s to keep them from freezing.

2-9. **DUSTY, HOT ENVIRONMENTS.** During operation in dusty, hot environments, care must be taken to keep the grills and radiators free of dust or debris that could cause overheating. Clean all grills and radiators as needed. (Use cloth, cleaning, item 1, Appendix D.)

2-10. **EMERGENCY PROCEDURES.** If the WRS is disabled because of major leak(s), electrical failure, or pump failure, the 2151 can still be operated according to the instructions below.

- a. Disconnect the WRS from the 2151 (see section 2-6.a.-f. for disconnection Procedures).
- b. Call Medical Maintenance to remove the steam trap plus on the bottom of the 2151. Place a pail on the floor below the plug to catch the exhaust.
- c. Check the water level of the 2151, and fill if necessary (see "Instruction Manual for Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal," page 6 for directions).
- d. Turn the 2151 heat switch on and continue sterilization. Be sure to monitor the water level periodically in the 2151.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

Section I. LUBRICATION INSTRUCTIONS.

- 3-1. **LUBRICATION.** There is no scheduled lubrication required. However, if the panel fasteners (screws) become hard to turn, apply a light coat of machine oil (use lubrication oil, item 2, Appendix D) to the screw shaft (figure 3-1).

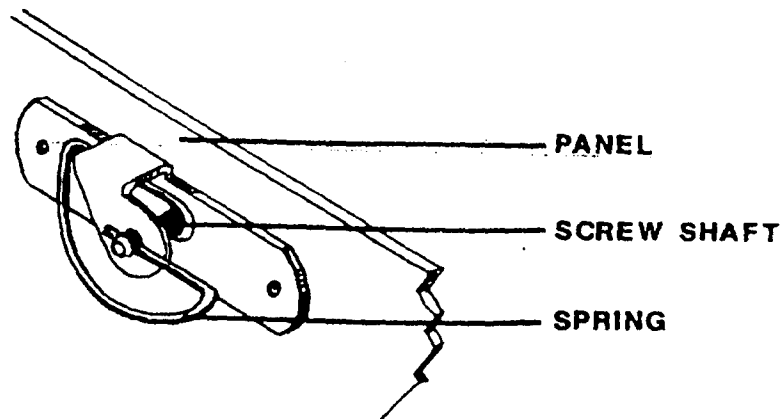


FIGURE 3-1. Panel Fastener.

Section II. TROUBLESHOOTING PROCEDURES

Table 3-1 lists the common malfunctions you may find during the operation of the WRS or its components. You should perform the tests/inspections and corrective actions in the order listed.

This manual can't list all malfunctions that may occur, all tests or inspections, and all corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

WARNING

If the WRS has been used recently, the fans should be allowed to finish cooling and to shut off automatically. Turn off the power supply and unplug the power cord at the source before tests or inspections.

TABLE 3-1. Troubleshooting Procedures for the WRS.

MALFUNCTION	TEST OR INSPECT	CORRECTIVE ACTION
1. WATER OVERHEATS	(1) If steam is escaping from vent hose, check temperature by draining a cup of water from the garden hose. (Discard first quart to make sure sample came from water tank.) Insert thermometer into cup of water.	If water is above 120 F, power to WRS may be off proceed to Malfunction 1.A
A. No electrical Power	(1) Check external electrical power source for defect.	Notify Organizational Maintenance if defective.
	(2) Check for tight connection between power source and receptacle.	Reconnect tightly.
	(3) Check power cord or plug for defect.	Notify Organizational Maintenance if defective.
B. Fans not running	(1) Check water temperature. Fans should be on if it is Above 120 degrees F.	Notify Organizational Maintenance if defective.

TABLE 2-3. TROUBLE SHOOTING PROCEDURES (continued)

MALFUNCTION	TEST OR INSPECT	CORRECTIVE ACTION
C. Water level too low	(1) Check for low or no water in water tank.	Add potable water to tank.
D. Pump not Running	(1) Listen for sounds of pump motor running (sound has lower pitch than fans).	If defective, notify Organizational Maintenance.
2. WATER LEAKS	(1) Check to make sure tank is not overfilled.	Drain until water level reaches full line on tank.
	(2) Check for leaks in fittings, hoses, and other components.	Notify Organizational Maintenance and drain the water tank.
	(3) Check quick disconnect Coupling for dirt lodged between poppet and seat or for improper coupling.	Clean if dirty. Recouple properly. If coupling is defective, notify Organizational Maintenance.
3. 2151 BOILER CAN'T BE REFILLED	(1) Check for low or no water in water tank.	Fill tank to full line with potable water.
	(2) Check if hoses are connected to wrong return connectors.	Recouple to correct
	(3) Other causes.	Notify Organizational Maintenance

Section III. OPERATOR MAINTENANCE

3-3. OPERATOR MAINTENANCE TASKS.

3-3.1 Clean both ends of the quick disconnect couplings before mating by wiping off the male connector plugs on the WRS and swabbing out the female sockets on the hoses with a clean cloth (use Cloth, cleaning, item 1, Appendix D).

3-3.2 Drain the water out of the water tank (section 2-6.e.) at least once every 200 hours of operation and refill (section 2-3.g.-1.) with potable water.

CHAPTER 4

MAINTENANCE OF AUXILIARY EQUIPMENT.

See "Instruction Manual for Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal." for instructions on maintenance of 2151(s).

CHAPTER 5

PREPARATION FOR STORAGE

5. Procedure:

5.1 Drain the water from the WRS and hoses.

5.2 Clean the WRS inside and outside.

5.3 Store the hoses, adapters, manual and power cord.

APPENDIX A

REFERENCES

A-1. SCOPE:

The following items can be used with this manual and should help you if needed.

A-2. ARMY REGULATIONS:

Army Medical Treatment Facilities: General Administration ...	AR 40-2
Sterilizing Medical, Surgical, Dental, Veterinary Material	AR 40-19
Medical Logistics, Policies, and Procedures	AR 40-61

A-3. FIELD MANUALS:

Evacuation of the Sick and Wounded	FM 8-35
Centralized Material Service/Selection	FM 8-38
Introduction to Operating Room Technique (6 th ed)	FM 8-73
Soldier's Manual 91B, Medical Specialist (Skill Level ½)	FM 8-91B1/2
Soldier's Manual 91B, Medical Specialist (Skill Level 3)	FM 8-91B3
Soldier's Manual 91B, Medical Specialist (Skill Level 4)	FM 8-91B4
First Aid for Soldiers	FM 21-11

A-4. TECHNICAL MANUALS:

Instruction Manual for Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal, NSN 6530-00-926-2151	
Maintenance Management Procedures for Medical Equipment	TB 38-750-2
Operator's Organizational, Direct Support, and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools List) for Water Recovery System	TM X-XXXX-XXX- 14&P

APPENDIX B

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS (BII) LISTS

B-1. SCOPE

The Components of End Item and Basic Items Lists are divided into the following sections:

a. Section I. Components of End Item. This listing is for informational purposes only, and is not authority to requisition replacements. These items are part of the end item, but are removed and separately packaged for transportation or shipment. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts.

b. Section II. Basic Issue Items. These are the minimum essential items required to place the WRS in operation, to operate it, and to perform emergency repairs. Although shipped separately packaged, BII must be with the WRS during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement BII, based on TOE/MTOE authorization of the end item.

B-2. EXPLANATION OF COLUMNS

The following provides an explanation of columns found in the tabular listings:

a. Column (1) – National Stock Number. Indicates the National Stock Number assigned to the item and will be used for requisitioning purposes.

b. Column (2) – Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the Federal Supply code for Manufacturer (FSCM) (in parentheses) followed by the part number.

c. Column (3) – Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (each-ea., inch-in., pair-pr.).

d. Column (4) – Quantity required (Qty rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

Section II. COMPONENTS OF END ITEM

(1) National Stock Number	(2) Description FSCM and Part Number	(3) U/M	(4) Qty rqr
	POWER CORD, 115 V	ea.	1
	KIT, 2151 ADAPTER	ea.	1
	RETURN HOSE	ea.	1
	EXHAUST HOSE	ea.	1
	GARDEN HOSE	ea.	1

APPENDIX C

ADDITIONAL AUTHORIZATION LIST

C-1. SCOPE

This appendix lists nonexpendable supplies and equipment needed to operate and maintain the WRS.

C-2. GENERAL

This list identifies items that do not have to accompany the WRS and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3. EXPLANATION OF LISTING

National stock numbers, descriptions, and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTAQ, MTOE, or JTA) which authorizes the item(s).

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION FSCM & PART NUMBER	(3) USABLE ON CODE	(4) U/M	(5) QTY AUTH
1. 7240-00-160-0455	PAIL, utility: 14 qt capacity	EA	1	1
2. 6685-01-070-1510	THERMOMETER, self- indicating, liquid(mercury)	EA	1	1
3. 7240-00-001-0978	PAN, polyethylene w/o cover 13 1/2 x 11 1/2 x 5 3/8	EA	1	1
4. 8415-01-092-3910	GLOVES, heat protective, type II	PR	1	1

APPENDIX D

EXPENDABLE SUPPLIES AND MATERIALS LIST

D-1. SCOPE

This appendix lists expendable supplies and materials needed to operate and maintain the WRS. These items are authorized to you by CTA 50-970, Expendable Items (Except Medical, Class V, Repair Parts, and Heraldic Items).

D-2. EXPLANATION OF COLUMNS

a. Column (1) – Item number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., “Use Cloths, cleaning, item 1, Appendix D”).

b. Column (2) – Level. This column identifies the lowest level of maintenance that requires the listed item.

c. Column (3) – National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) – Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the Federal Supply Code for Manufacturer (FSCM) in parentheses followed by the part number.

e. Column (5) – Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

(1)	(2)	(3)	(4)	(5)
ITEM NUMBER		NATIONAL STOCK NUMBER	DESCRIPTION	U/M
1.	C	7920-01-004-7847	Cloth, cleaning	1 rl
2.	C	9150-00-235-5589	Lubricating oil	2 oz
3.	C	7930-00-664-6910	Glass cleaner	1 bx

DESCRIPTION

Turbine pumps use an impeller with many blades and close spacing to provide pressure to 130 PSI. There is no metal-to-metal contact and pumps can handle liquids with entrapped air without vapor locking. Turbine pumps are used in many industrial and commercial applications such as boiler feed on steam process, condensation return, pressure booster service, water treatment, spray equipment, reverse osmosis filtration equipment and liquid transfer where no suction lift is required. Maximum liquid temperature is 160°F; minimum temperature is 40°F. Maximum viscosity is 100 SSU.

Corrosive (non-saline), abrasive or highly viscous liquids or liquids with particles in suspension should not be pumped with a turbine design pump. These pumps are designed for use with saltwater brine and other nonflammable liquids compatible with pump component material: bronze housing, impeller and shaft sleeve; mechanical seal with carbon/ceramic seats, S.S. parts and Buna-N parts.

Pumps are close-coupled to Dayton 3450 RPM, 60 Hz ball bearing motors. Single-phase units have capacitor start, open dripproof motors with automatic reset thermal protection.

⚠WARNING

This pump is not suitable to be used pumping liquids that contain dirt, particles, shavings, chips, etc. The close tolerances of the impeller and housing will cause the particles to jam pump/motor. Failure to follow this warning can cause pump/motor to fail, which can result in property damage and/or personal injury and will void the product warranty.

GENERAL SAFETY INFORMATION

1. Know the pump application, limitations, and potential hazards.
2. Make certain that the power source conforms to the requirements of your equipment.
3. When wiring an electrically driven pump, follow all electrical and safety codes, as well as the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA) in the United States.

⚠WARNING

Do not use to pump flammable or explosive fluids such as gasoline, fuel oil, kerosene, etc. Do not use in flammable and/or explosive atmospheres.

Models 2P105 and 2P106 can be used for either 115V (single phase) or 230V (single phase). These units can be wired for either portability, with flexible 3-wire cord, or permanent installation using a supply with a ground.

- Provide adequate protection and guarding around moving parts and electrical components.
- Disconnect power before servicing. If the power disconnect is out-of-sight, lock in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electrical shock!
- Release all pressure within the system before servicing any component.
- Drain all liquids from the system before servicing.

- Secure the discharge line before starting the pump. An unsecured discharge line will whip, possibly causing personal injury and/or property damage.
- Check hoses for weak or worn condition before each use, making certain that all connections are secure.
- Periodically inspect pump and system components. Perform routine maintenance as required.
- Provide a pressure relief system for pumps whose discharge line can be shut-off or discharged.

PERSONAL SAFETY

- Wear safety glasses at all times when working with pumps.
- Keep work area clean, uncluttered and properly lighted; replace all unused tools and equipment.
- Keep visitors at a safe distance from the work area.
- Make workshop childproof-with padlocks, master switches, and by removing started keys.

This unit is not waterproof and is not intended to be used in showers, saunas, and/or other potentially wet locations. The motor is designed to be used in a clean, dry location with access to an adequate supply of cooling air. Ambient temperature around the motor should not exceed 104°F (40°C). For outdoor installations, motor must be protected by a cover that does not block airflow to and around the motor. This unit is not weatherproof nor is it able to be submerged in water or any other liquid.

ALL WIRING SHOULD BE PERFORMED BY A QUALIFIED ELECTRICIAN

- Protect electrical cord from sharp objects, hot surfaces, oil, and chemicals. Avoid kinking the cord
- Replace or repair damaged or worn cords immediately.
- Keep fingers and foreign objects away from ventilation and other openings. Do not insert any objects into the motor.
- Use wire of adequate size to minimize voltage drop at the motor.
- Disconnect power before servicing a motor or its load. If the power disconnect is out-of sight, lock it in the open position and tag it to prevent unexpected application of power.
- Do not touch an operating motor. Modern motors are designed to operate at high temperatures.

⚠WARNING

Do not handle a pump or pump motor with wet hands or when standing on wet or a damp surface, or in water. All single phase pump motors are equipped with an automatic resetting thermal protector and may restart unexpectedly. Protector tripping is an indication of motor overloading as a result of operating the pump at low heads (low discharge restriction), excessively high or low voltage, inadequate wiring, incorrect motor connections, or a defective motor or pump. Failure to follow the General Safety Information and all Warnings could result in fatal electrical shock!

⚠INSTALLATION WARNING

In any installations where property damage and/or personal injury might result from an inoperative or leaking pump due to power outages, discharge line blockages, or any other reason, a backup system(s) should be used. In order to safely use this product, familiarize yourself with this pump and also with the liquid (chemical, etc.) that is going to be pumped through the pump. This pump is not suitable for many liquids.

A wrong connection can burn out of the pump motor, cause an electrical short, or produce an electrical shock. Failure to follow the warning can result in property damage and/or personal injury.

- Inspect impeller for proper rotation. When viewing the pump end, the motor should rotate counterclockwise.
- Do not operate pump dry. Mechanical seal damage will occur.

⚠CAUTION

Clockwise rotation when facing pump inlet will destroy motor. Incorrect wiring is not covered under limited warranty.

IMPORTANT

Power should be applied momentarily to the pump at first and the direction of rotation checked. When viewing unit from the front of the pump housing, impeller rotation should be counterclockwise. If it is not, disconnect power and recheck wiring to motor, interchange any two incoming power leads. On initial startup, check power consumption to be sure motor is not overloaded.

NOTE: Never shut off discharge or restrict suction flow while unit is operating.

⚠MAINTENANCE WARNING

This is a very difficult pump to repair; therefore, only a qualified electrician or technician should attempt to repair this unit. Improper repair and/or assembly can cause an electrical shock hazard.

GENERAL

- Pump should be drained if subjected to freezing temperatures. A drain plug is provided on the pump casing.
- Clean the suction line strainer at regular intervals.
- Periodically clean dirt accumulations from open-type motors, especially in and around vent openings, preferably by vacuuming (avoids imbedding dirt in windings). Properly selected and installed electric motors are capable of operating for years with minimal maintenance.
- Pump motor is provided with sealed ball bearings. Normal relubrication of the bearings is not required.
- Periodically check that electrical connections are tight.
- Pump should be checked daily, weekly, monthly, etc. for proper operation. If anything has changed since unit was new, unit should be removed and repaired or replaced. Only qualified electricians or technicians should attempt to repair this unit. Improper repair and/or assembly can cause an electrical shock hazard.

MECHANICAL SEAL

All Teel pumps are furnished with a precision mechanical seal. This seal is installed and checked at the factory and should require no adjustment at the time of the installation of the pump. Running the pump without water will result in rapid seal failure. After the pump has been in service for a long period of time, or if the pump has seen severe service on abrasive materials, it may be necessary to replace this seal.

Leakage can be detected by a dripping or flow of liquid from the area around the motor shaft.

⊗ CAUTION

Precision lapped faces on the mechanical seal are easily damaged. Handle your replacement seal carefully and read these instructions before attempting to replace the seal.

DISASSEMBLY OF PUMP

After the pump has been removed from the intake and discharge ports, the pump can be readily disassembled.

1. Remove the four 3/8" diameter bolts that attach to front cover of the body. Then remove the cover and O-ring gasket.
2. The impeller floats on the pump shaft sleeve; therefore, it can be readily removed.
3. Loosen set screw on pump shaft sleeve. The pump shaft sleeve is threaded on the motor shaft. Turn the pump shaft sleeve counterclockwise to remove.

NOTE: It will be necessary to hold the motor shaft. A screwdriver slot or two flats for use with an open end 7/16" wrench are provided at the rear of the motor shaft (pry off cap for access). To prevent motor shaft from turning, either insert a larger screwdriver blade into the slot, or use a 7/16" wrench across the flats.

4. The seal will come off with the shaft sleeve.
5. To remove the seat, insert a hook in between the motor shaft in the seat and behind the seat, then pull it out or remove the body from the motor and push the seat out through the body.
6. Clearance between the impeller, the body, and the cover is held to a minimum for high pressure performance. Therefore, any wear in these parts due to pumping abrasives, etc., would affect the pump performance. Replace parts when necessary.
7. If it becomes necessary to replace the seal or seat, always replace them with a complete seal & seat assembly.

ASSEMBLY OF PUMP

1. Press the seat into the body, taking care not to damage the seat face.
2. Assemble the body over the motor shaft and pilot and attach with four 3/8" diameter screws. Torque is 15 to 20 lb-ft.
3. Assemble the seal over the pump shaft sleeve with the steel spring retainer up against the shaft shoulder. If needed, a light coating of soapy water can be used on the inside of the seal bellows to facilitate for easier installation.
4. Screw the pump shaft sleeve onto the motor shaft and turn clockwise until it bottoms. This location provides the proper seal spring tension for good surface contact between the seal and seat. If the key is assembled in the pump shaft before the shaft is threaded on, it will provide a better grip for tightening. Tighten set screw on sleeve.
5. Assemble the impeller over the pump shaft sleeve. Make sure the impeller floats freely.
6. Assemble the O-ring gasket and attach the cover with the 3/8" diameter screws. Torque to 15 to 20 lb-ft.
7. Before and after the plumbing is attached to the pump, make sure the pump turns freely. Rotate the pump by inserting a screwdriver into the back end of the motor and turning the motor shaft.

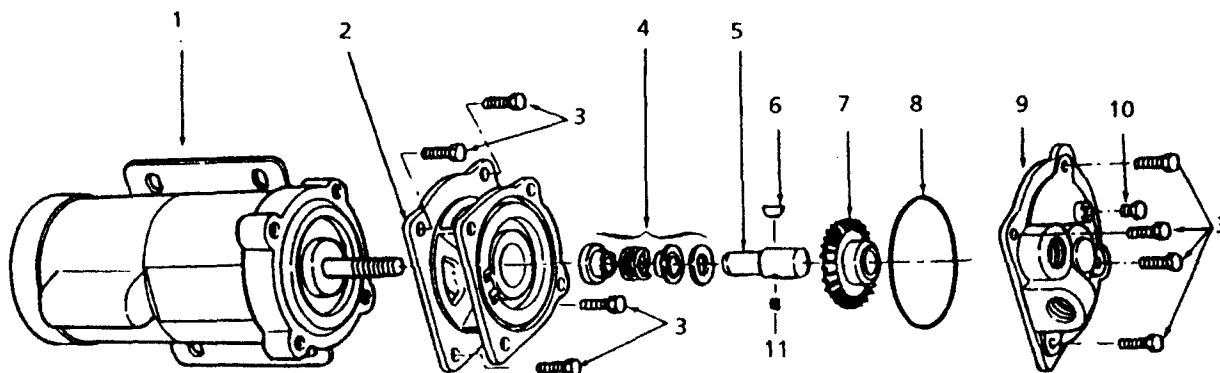


Figure 4 – Replacement Parts Illustration

Replacement Parts List

Ref. No.	Description	Part No. for Models:				Qty.
		2PI05	2PI06	2PI07	2PI08	
1	Motor assembly	6K581	6K516	3N234	3N236	1
2	Bronze body	13764	13765	13764	13765	1
3	3/8-16 x 3/4" S.S. Hex head screw	11633	11633	11633	11633	8
4	Mechanical seal (includes carbon/ceramic seats, S.S. parts and Buna-N parts)	17682	17682	17682	17682	1
	Optional mechanical seal (includes carbon ceramic seats, S.S. parts and Viton parts)	17683	17683	17683	17683	1
5	Shaft sleeve (includes set screw (Ref. No. 11))	13768	13768	13768	13768	1
6	Key	13777	13777	13777	13777	1
7	Bronze impeller	13769	13770	13769	13770	1
8	O-ring gasket, Buna-N	13774	13774	13774	13774	1
9	Bronze Cover	13766	13767	13766	13767	1
10	Brass drain plug	00336	00336	00336	00336	1
11	1/4-20 x 1/2" Set screw	13859	13859	13859	13859	1

**Installation Instructions
2151 Water Recovery System Adaptor Kit**

1-1. SCOPE:

- a. Equipment Name: 2151 WRS Adaptor Kit.
- b. Purpose of Equipment: The 2151 WRS Adaptor Kit modifies the Sterilizer, Surgical Instrument and Dressing, Pressure, Steam, Electric or Gasoline Burner Heated, Corrosion Resisting Metal, NSN 6530-00-926-2151, (hereafter referred to as the 2151) so that exhaust can be collected, condensed and returned to the 2151 by the Water Recovery System (WRS).
- c. Components of the 2151 WRS Adaptor Kit:
 - Steam collection assembly
 - ~~Operating valve hose adaptor~~
 - Operating valve hose
 - Return connector
 - Exhaust hose
 - Return hose
 - Garden hose
 - Pipe plug
 - Teflon tape
- d. Tools needed for Installation of 2151 WRS Adaptor Kit:
 - 2 Open end wrenches (1/2 X 9/16 and 11/16 X 5/8 inch)
 - Allen wrench (5/16 inch)
 - Flat-blade screwdriver

1-2. OPERATING PRINCIPLES. Once the 2151 WRS Adaptor Kit has been installed, the operating principles are as follows:

1-2.1. Steam exhausted from the 2151 operating valve and the steam trap flows to the exhaust connector, through the exhaust hose, and into the WRS, where it is condensed into water.

1-2.2. Water is returned from the WRS to the 2151 boiler through the return hose to the 2151 return connector installed in the boiler (near the heating assembly).

2-1. INSTALLATION OF 2151 WRS ADAPTOR KIT:

- a. Preparation of the 2151: Disconnect the electrical power and drain the 2151 (see 2151 Operator's Manual).

b. Steam Trap Removal: Loosen the union nut (figure 2-1) from the steam trap until it disengages from the threads on the steam trap. Remove the two 1/4-20 flat head screws that fasten the pipe support to the floor of the 2151 and lift out the steam trap.

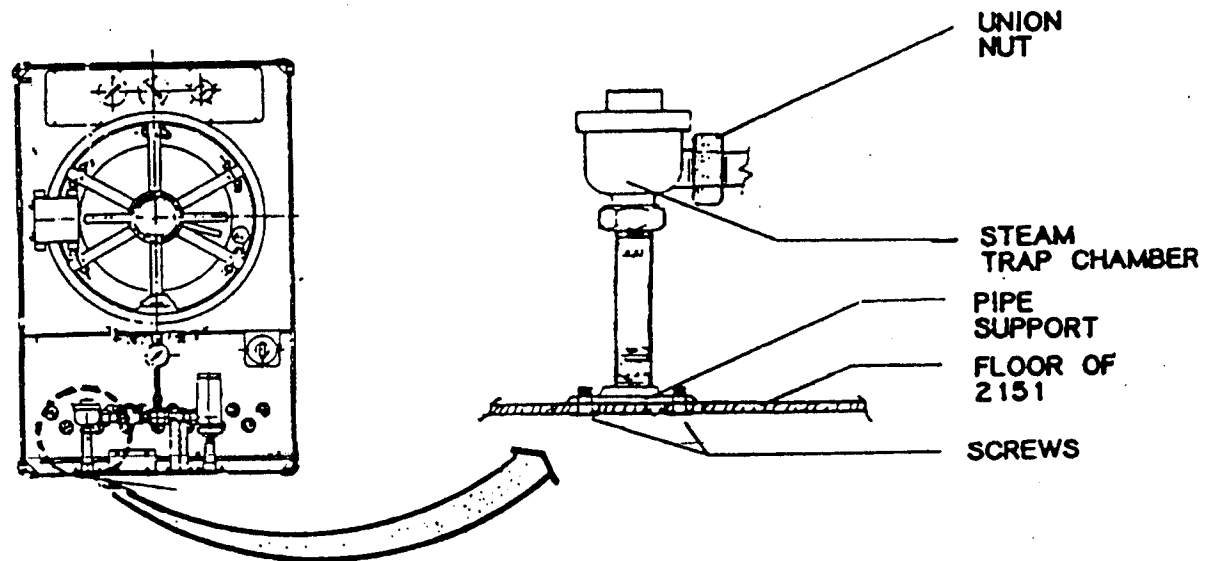


Figure 2-1. Steam Trap Removal.

c. Steam Trap Chamber and Pipe Support Removal: Unscrew the pipe support and the steam trap chamber from the pipe nipple (figure 2-2). The pipe nipple will be replaced with the steam collection assembly.

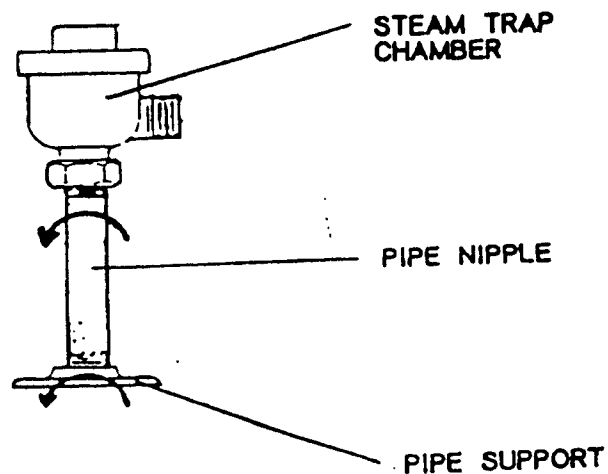


Figure 2-2. Steam trap Chamber and Pipe Support Removal.

d. Application of Teflon Tape: Apply teflon tape (figures 2-3 and 2-4) to both 3/8" pipe nipples of the Steam Collection Assembly. Apply Teflon tape starting at the third thread from the end (skip the first two) and wind clockwise.

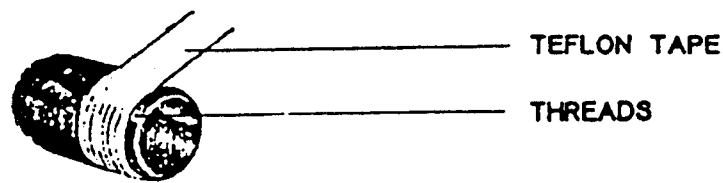


Figure 2-3. Teflon Tape Application.

e. Steam Trap Mounting: Thread the steam trap chamber and the pipe support onto the nipples of the steam collection assembly (figure 2-4) and tighten. Be sure to align the steam trap inlet and the pipe support so that the operating valve hose can be attached (figure 2-9).

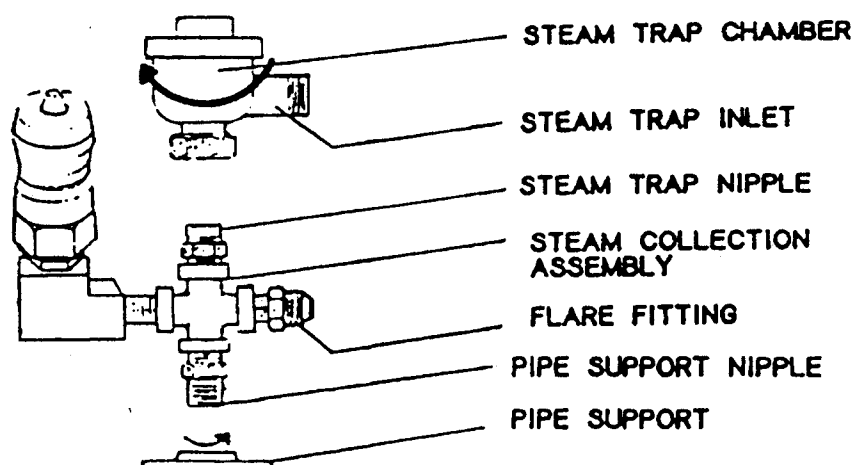


Figure 2-4. Steam Trap Mounting.

f. Steam trap assembly installation: Reattach the pipe support to the 2151 floor (figure 2-5) using the two 1/4-20 screws removed earlier. Attach the steam trap inlet pipe to the steam trap inlet and tighten the union nut. Apply teflon tape to the pipe plug and insert the plug into the floor of the 2151 and the bottom of pipe support. Tighten using the allen wrench.

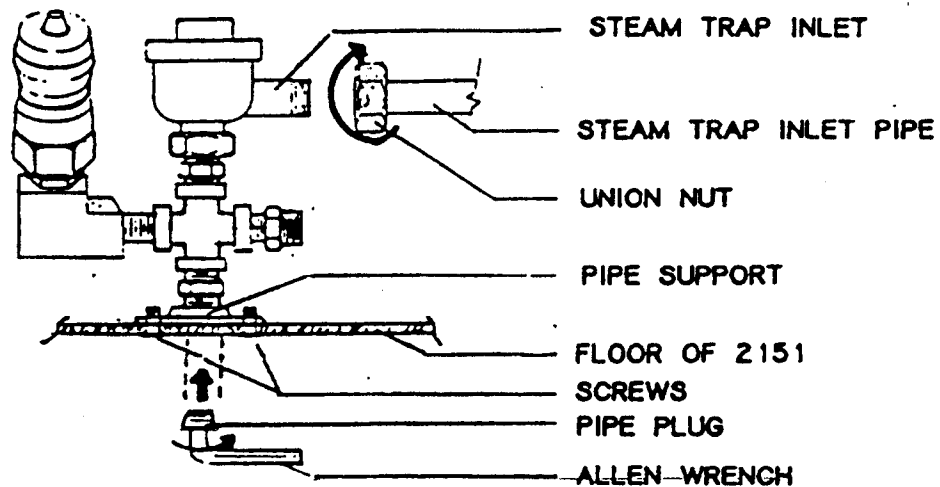


Figure 2-5. Steam Trap Assembly Installation.

g. Operating valve modifications: Remove the vent tube nut and vent tube from the operating valve (figure 2-6). Remove the fitting nut from the operating valve ejector port and apply teflon tape to the pipe threads on the port.

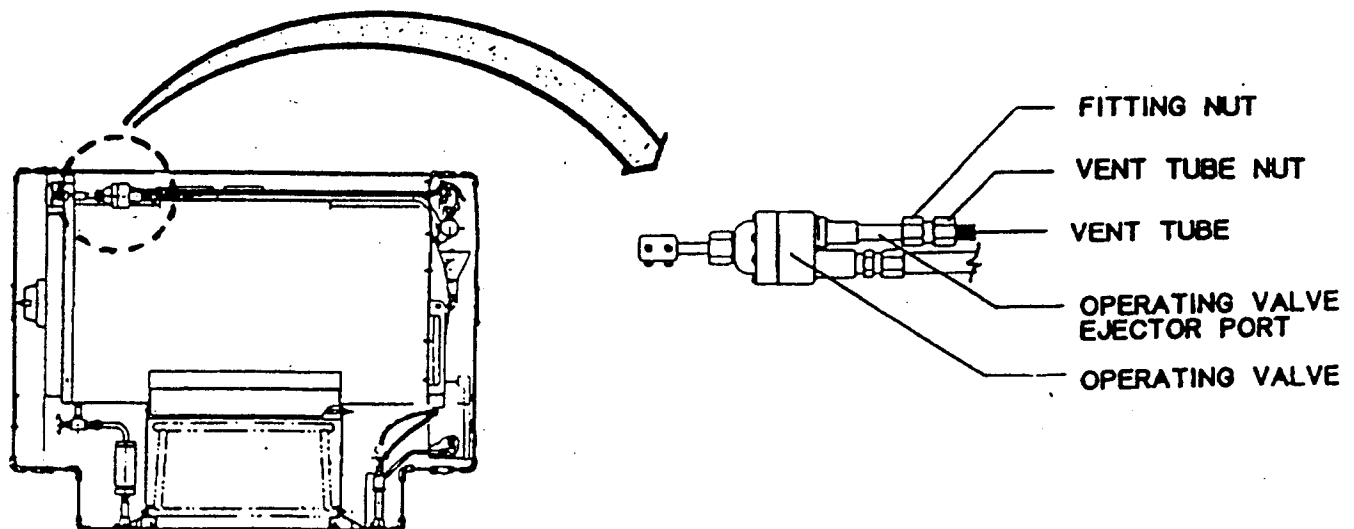


Figure 2-6. Vent Tube Removal.

h. Operating valve hose installation: Thread the operating valve hose adaptor onto the operating valve ejector port and tighten (figure 2-7). Attach the flare nut on one end of the operating valve hose to the operating valve hose adaptor. (Do not tighten the nut at this time.)

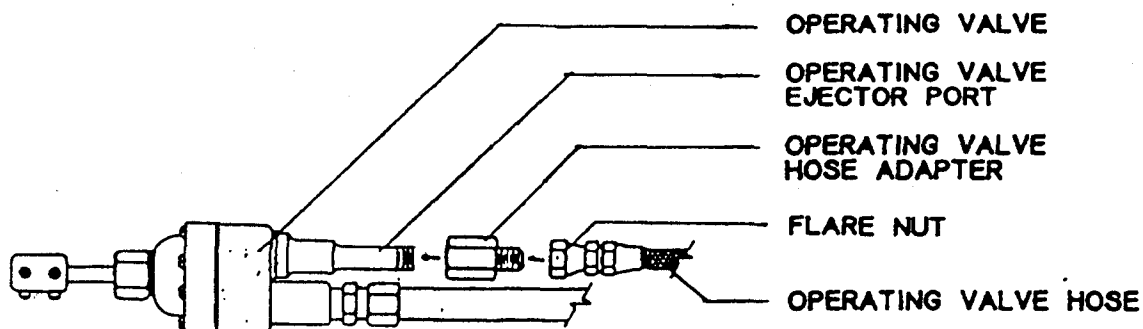


Figure 2-7. Modification of Operating Valve.

i. Routing the hose: Route the operating valve hose around the right side of the chamber (same side as the operating valve) to the steam trap assembly as shown in figures 2-8 and 2-9.

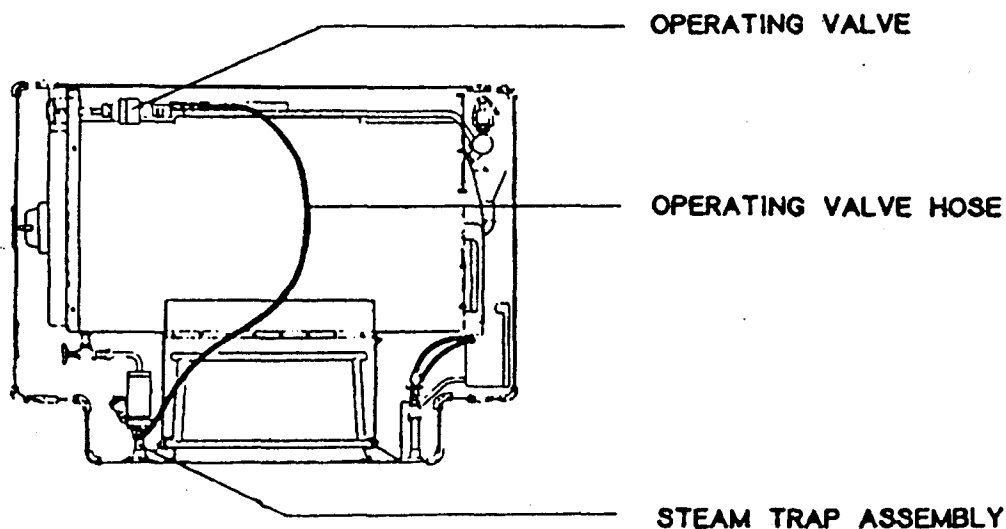


Figure 2-8. Operating Valve Hose Routing.

j. Operating Valve Hose Attachment: Thread the flare nut at the loose end of the hose to the flare fitting of the steam trap assembly (figure 2-9). Tighten the flare nuts on both ends of the operating valve hose.

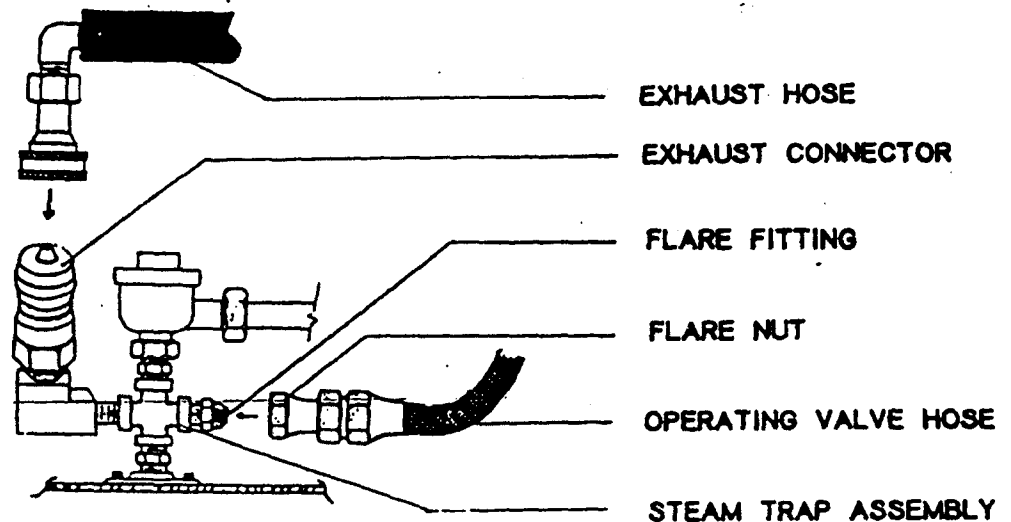


Figure 2-9. Operating Valve and Exhaust Hose Attachment.

k. Exhaust Hose Attachment: Attach the exhaust hose to the exhaust collector (figure 2-9). (For directions on coupling procedure, see WRS Operator's Manual, section 2-3.i.).

l. Return connector installation: Facing the back of the 2151, locate the left hex head pipe plug found underneath the heater assembly (figure 2-10). Remove the pipe plug from the boiler port. Apply teflon tape to the return connector threads. Thread the connector into the boiler port and tighten.

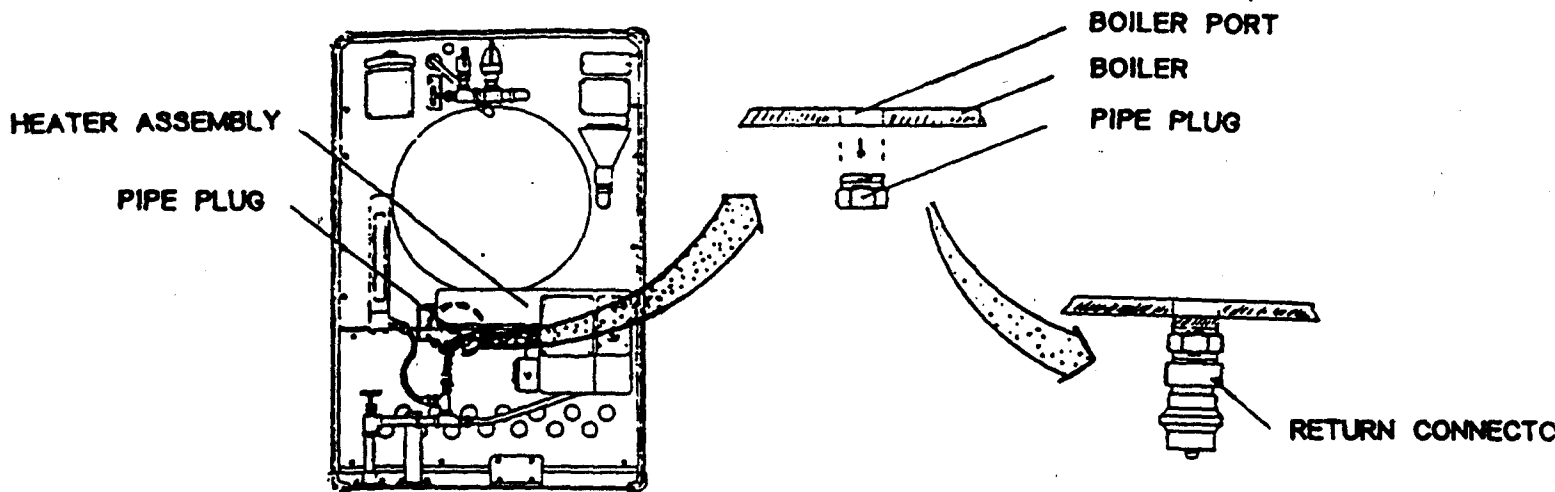


Figure 2-10. Installation of Return Connector.

m. Attachment of return hose: Attach the return hose to the return connector (figure 2-11).

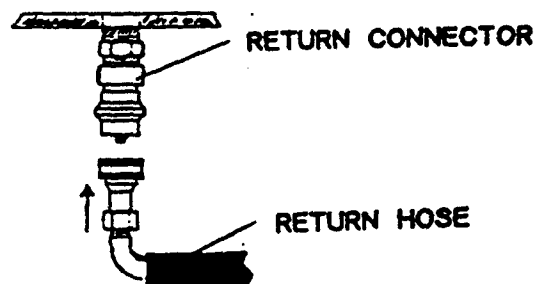


Figure 2-11. Attachment of Return Hose.

n. Check for Water Leaks: Attach the other ends of the exhaust and return hoses to the WRS and fill the 2151 and the WRS according to WRS Operator's Manual. Turn on the power to the 2151 and WRS and check the 2151 for leaks. If the modifications that were made to the 2151 leak, see Operator and Maintenance Manual for WRS on how to correct the leaks.

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